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LABORATORY PROCEDURE FOR TREATING AGGREGATE WITH LIME SLURRY FOR ASPHALT CONCRETE MIX DESIGN

SCOPE

This protocol provides a laboratory procedure for treating aggregate with lime slurry for use in asphalt concrete mix design.

APPARATUS

1. *Balance* - Accurate to 0.1 g.

2. *Plastic Containers* – One liter with watertight lids for storing materials.

3. *Graduated cylinder* - 100 ml

4. *Oven and equipment from California Test 304* - for preparation of design set.

5. *Miscellaneous Apparatus and Tools* – Trowel or spoon, heat resistant gloves and safety glasses or goggles.

MATERIALS

1. Aggregate - Coarse aggregate and fine aggregate stockpiles proposed for use on the project shall be treated and marinated separately. Coarse aggregate stockpiles contain more than 50 percent material retained on the 4.75 mm sieve. Fine aggregate stockpiles contain less than or equal to 50 percent material retained on the 4.75 mm sieve.

2. Lime - Lime shall be a high-calcium hydrated lime that conforms to the provisions in Section 24-1.02, “Materials,” of the Standard Specifications.

3. Water - Water shall be free from oil and other impurities and shall contain not more than 650 parts per million of chlorides (Cl) and not more than 1300 parts per million of sulfates (SO_4).

PROCEDURE

A. Preparation of Aggregate Samples

1. Add 1.0 percent water by dry mass of aggregate to each coarse and fine aggregate stockpile sample and mix thoroughly.

2. Place the damp coarse and fine aggregate samples in separate plastic containers to retain moisture while preparing lime slurry.

B. Preparation of Lime Slurry

1. Determine the mass of lime required to provide the desired content, by dry mass of aggregate, for each sample.

   NOTE: The Contractor, as part of the mix design process, shall determine the exact proportion of lime. The lime content for coarse aggregate shall be 0.4 percent to 1.0 percent by mass of the dry aggregate sample and the lime content for fine aggregate shall be 1.5 percent to 2.0 percent by mass of the dry aggregate sample. The combined aggregate shall contain not less than 0.8 percent and not more than 1.5 percent lime by mass of dry aggregate. The amount of lime for open graded asphalt concrete may be reduced to between 0.5 percent and 1.0 percent.

2. Mix one (1) part of lime thoroughly with two (2) to three (3) parts of water by mass. The amount of water in the slurry shall be enough to assure complete coating of aggregate particles with slurry.

   NOTE: The lime slurry shall be free of any lime balls or clods.

C. Preparation of Aggregate-Lime Slurry Mixture

1. Use a trowel or spoon to thoroughly mix the lime slurry with the moisture-conditioned coarse aggregate samples prepared in Section A.

2. Use a trowel or spoon to thoroughly mix the lime slurry with the moisture-conditioned fine aggregate samples prepared in Section A.

3. After mixing, place the lime-treated coarse and fine aggregate mixtures in separate containers to cure for a minimum of 24 hours and a maximum of 60 days.

4. After the lime-treated aggregate samples have marinated for at least 24 hours, combine the samples in accordance with California Test 304 and mix the composite blend thoroughly with a trowel or spoon.

NOTE: Avoid segregation. Break up any lime balls or clods during mixing, as necessary.

5. Place the lime-treated blended aggregate in a pan and oven-dry to constant weight at a temperature of 110 ±5°C and proceed with the mix design in accordance with California Test 304.

   NOTE: If fine particles or lime residue sticks to the pan after drying, use a short bristle brush to remove the particles or residue and recombine the material with the rest of the sample.

   NOTE: Aggregate shall not be re-treated with lime once it has been treated.

PRECAUTIONS

Hydrated lime is a fine powder. Extra care should be taken when working with lime. Adequate ventilation and the proper safety equipment should be utilized. Avoid contact with the skin and eyes, and avoid breathing contaminated air.

Prior to sampling, handling materials or testing, Caltrans personnel are required to read Part A (Section 5.0), Part B (Sections 5.0, 6.0 and 10.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual and the Materials Safety Data Sheets (MSDS) for all materials used.